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ANNOTATED CHECKLIST AND KEY FOR SMUT FUNGI IN COLOMBIA*

Lista anotada y clave para los ustilaginales de Colombia

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ABSTRACT

71 species of smut fungi known for Colombia are cited in a checklist together with their host plants, collection data, and some comments. 20 species of smut fungi are reported for the first time for Colombia. The list includes the new species *Aurantiosporium colombianum* and the new combination *Sporisorium concelatum*. *Ustilago garcesi* is recognized as a synonym of *Sporisorium panici-leucophaei*. Four species of host plants were not yet known to be infected by the respective smut species. The smuts known for Colombia are presented in a key which contains distinctive characteristics of sori and spores.

Key words. *Aurantiosporium colombianum*, *Sporisorium concelatum*, *Sporisorium paspali-notati*, Ustilaginales, *Ustilago garcesi*.

RESUMEN

71 especies de carbón conocidas para Colombia se citan en una lista junto con sus plantas hospederas, datos de colección y algunos comentarios. Veinte especies de carbón se reportan por primera vez para Colombia. La lista incluye la especie nueva *Aurantiosporium colombianum* y la combinación nueva *Sporisorium concelatum*. *Ustilago garcesi* es un sinónimo de *Sporisorium panici-leucophaei.* Cuatro especies de plantas hospederas se citan por primera vez como hospedero de su respectivo carbón. Los carbones conocidos para Colombia se presentan en una clave que incluye las características distintivas de los soros y de las esporas.

Palabras clave. *Aurantiosporium colombianum*, *Sporisorium concelatum*, Ustilaginales, *Ustilago garcesi*.

INTRODUCTION

After the rust fungi (Uredinales), the smut fungi (Ustilaginomycetes and Microbotryales, comp. Bauer et al. 1997 and Bauer et al. 2001) are the second most important group of plant parasitic Basidiomycota. On specific host plants, in more or less specific host organs, they develop usually dark, powdery masses of teliospores ("spores") in sori. The teliospores are liberated, dispersed, and germinate with basidia in humid environment. After a more or less prolonged saprophytic stage, dikaryotic hyphae infect susceptible host plants.

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In a first account of smut fungi in Colombia, Molina-Valero (1980) cited 40 species, recording 22 for the first time. The present list includes his results as well as records published by Jackson (1930), Dennis (1970), and Zundel (1945, 1953). Some species were recently described as new from Colombian material (Vánky 1995, 1996, Piepenbring 2000). This study was carried out during the preparation of a volume of the Flora Neotropica, where complete species descriptions with illustrations will be included.

MATERIALS AND METHODS

The specimens of the smut fungi studied for this publication are mainly deposited in the Herbario Nacional de Colombia (COL). Further specimens and duplicates are deposited in BPI, MEDEL, MMUNM, TUB, and B. Most of the results presented here were obtained by field research and herbarium work of the author assisted by A. Gil Correa. In the herbaria COL, MMUNM, and MEDEL, specimens of potential host species (mainly Poaceae and Cyperaceae) were checked for presence of smut sori. Infected parts were separated and intergrated in the fungus collection of COL. Further valuable specimens were provided by P. Buriticá (Medellín).

ANNOTATED CHECKLIST OF SMUT FUNGI IN COLOMBIA

1. *Anthracoidea altiphila* Vánky & M. Piepenbr., *in* Vánky, Mycotaxon **51:** 166. 1994.

On *Carex chordalis* Liebm.
Colombian specimens examined: Boyacá: Duitama, Páramo de La Rusia, 3450-3500 m, 30 Nov 1978, *Díaz 1368* (COL). **Quindío:** Pijao, road to Páramo del Chilí, 3300-3600 m, 17 Sep 1998, *Gil et al. 89, 98* (COL, TUB).
Literature: Dennis (1970); Molina-Valero (1980), as *Cintractia caricis* (Pers.) Magnus, a collective species.

On *Carex fecunda* Steudel, a new host species for *A. altiphila*
Colombian specimen examined: Cundinamarca: Páramo de Sumapaz, Valle Quebrada Honda, ca. 2 km SW Andabobos, 3715 m, 10 Feb 1972, *Cleef 1557* (COL).
The identification of *A. altiphila* on this host species is preliminar. The material might represent a different (new?) species.

On *Carex jamesonii* Boott
Colombian specimens examined: Cauca: Puracé, Páramo, 3300 m, 27 Dec 1988, *Ortiz 1277* (COL). **Nariño:** road Pasto-Airport, 24 Jan 1976, *Buriticá et al. 76-265, mis. Buriticá* (TUB). **Quindío:** Salento, Navarco, 2800-2900 m, 20 Nov 1990, *Galeano et al. 2134* (COL). **Risaralda:** Pereira, Parque Regional Ucumarí, El Cedral, at the Río Otún, 2150 m, (without date), *Bernal et al. 1561* (COL). **Santander:** Santa Elena, 1500-2000 m, 1 Jan 1921, *Archer 1280* (B). **Tolima:** Cordillera Central, La Línea-Cerro El Campanario, 3580-3400 m, 4 Mar 1969, *Cuatrecasas & Echeverry 27696* (COL).

On *Carex lemanniana* Boott
Colombian specimen examined: Cundinamarca: Tausa, Laguna del Neusa, 3000 m, 5 Sep 1998, *Gil et al. 24* (COL, TUB).

On *Carex pichinchensis* Kunth
Colombian specimens examined: Cundinamarca: La Calera, National Parc Chingaza, 3100-3500 m, 12 Sep 1998, *Gil et al. 46, 208* (COL, TUB).

2. *Anthracoidea uleana* (Syd. & P. Syd.) Vánky, Mycotaxon **62:** 144. 1997.
Cintractia pannucea Liro, Ann. Bot. Soc. Zool. Bot. Fenn. "Vanamo" **6:** 5. 1935. *Anthracoidea pannucea* (Liro) Vánky, Acta Univ. Ups. Symb. Bot. Upsal. **24** (2): 15. 1985.

On *Carex bonplandii* Kunth
Selected Colombian specimens examined: Cauca: Puracé, Laguna San Rafael, 3200 m, 18 Apr 1982, *Torres 927* (COL), 6 Oct 1984, *Lozano et al. 4636* (COL). **Cundinamarca:** near Bogotá, Sabana de Bogotá, 2840 m, 15 Aug 1939, *Cuatrecasas 6664* (COL); road Gachetá-Gunteque, 18 Sep 1976, *Buriticá 76-515, mis. Buriticá* (TUB);

National Parc Chingaza, 2915 m, 6 Jun 1981, *Franco & Rangel 82* (COL); Laguna del Neusa, 3000 m, 5 Sep 1998, *Gil et al. 23* (COL, TUB); National Parc Chingaza, 3100 m, 12 Sep 1998, *Gil et al. 51* (COL, TUB). **Huila:** La Plata, 2380 m, 1 Oct 1984, *Lozano et al. 4349* (COL). **Magdalena:** Sierra Nevada de Santa Marta, at the Río Sevilla, 3570 m, 23 Jan 1959, *Barclay & Juajibioy 6650* (COL), 3470 m, 25 Jan 1959, *Barclay & Juajibioy 6672* (COL). **Meta:** Macizo de Sumapaz, Laguna La Guitarra, 3380-3420 m, 4 Jul 1981, *Díaz 2426* (COL). **Putumayo:** between El Encano and Sibundoy, Páramo de San Antonio del Bordoncillo, 3250 m, 4 Jan 1941, *Cuatrecasas 11763* (COL). **Quindío:** Páramo del Chilí, 3600 m, 17 Sep 1998, *Gil et al. 110* (COL, TUB). **Santander:** Onzaga, Vereda Chaguacá, 2640 m, 2 Apr 1976, *Torres et al. 625* (COL). **Tolima:** Santa Isabel, at the Río Totarito, 3300-3400 m, (without date), *Díaz et al. 2071* (COL). **Valle del Cauca:** Barragán, Páramo de Bavaya, 3680-3600 m, 16-17 Mar 1946, *Cuatrecasas 20102* (COL).
Literature: Dennis (1970); Molina-Valero (1980), as *Cintractia pannucea*.

3. *Aurantiosporium colombianum* M. Piepenbr., **sp. nov.** Type. On *Scleria lagoensis* Boeck. Colombia. Magdalena: Santa Marta, 1898-1899, *Smith 237, mis. K. Camelbeke, ex BM 598728* (holotype, COL; isotype, BPI).
Differt ab *A. subnitenti* (J. Schröter & Henn.) M. Piepenbr. et al. sporis maioribus [14-16(-17) x 16-20(-22) µm] in glomerulis magnis [100-180(-210) x 150-250(-300) µm] et parietum sporarum stratis externis luteolis ca. 1-4(-5) µm.
Development of sori in individual spikelets. **Sori** replacing flowers in female spikelets and in rachillae of male spikelets; formed by hypertrophied host tissue; globose in female spikelets, elongated in male spikelets, with glumes attached to them; in female spikelets ca. 3-4 x 4-5 mm; in male spikelets ca. 2-2.5 x 7-10 mm; when old, of orange color. **Spore mass** composed of balls of teliospores; crumbly; of dark orange color. **Balls of teliospores** separating into single cells under pressure; mostly elongated, of irregular shape; 100-180(-210) x 150-250(-300) µm. **Teliospores** bluntly polyhedral; 14-16(-17) x 16-20(-22) µm; olivaceous yellowish to orange. **Spore walls** with inner layers ca. 1 µm thick; yellowish; outer layers ca. 1-4(-5) µm thick, light yellowish hyaline; smooth.
A. colombianum differs from *A. subnitens* by larger spores in larger balls and by thicker and lighter coloured outer spore wall layers.

4. *Aurantiosporium subnitens* (Schröter & Henn.) M. Piepenbr., Vánky & Oberw., Pl. Syst. Evol. **199:** 62. 1996.

On *Scleria melaleuca* Reichb.
Colombian specimen examined: Norte de Santander: Cordillera Oriental, Region Sarare, at the Río Cubugón and Quebrada de Gibraltar, 320 m, 15 Dec 1941, *Cuatrecasas 13216* (COL).
This is the first record of this species of smut fungi for Colombia.

5. *Cintractia amazonica* Syd. & P. Syd., Ann. Mycol. **14:** 73. 1916.

On *Rhynchospora barbata* (Vahl) Kunth
Colombian specimen examined: Meta: 20 km from San Martín to caño Chunaipo, 4 Jan 1980, *Buriticá 80-1, mis. Buriticá* (TUB).
This is the first record of this species of smut fungi for Colombia.

6. *Cintractia axicola* (Berk.) Cornu, Ann. Sci. Nat. Bot. VI **15:** 279. 1883.

On *Fimbristylis dichotoma* (L.) Vahl
Colombian specimens examined: Antioquia: Amagá, Minas, 1350 m, 26 Sep 1998, *Gil et al. 205* (COL, TUB). **Valle del Cauca:** Buenaventura, Costa del Pacífico, Nov 1945, *Cuatrecasas 19770-14* (BPI 170441). **Santander:** 1944, *Fassett 25465* (BPI 170398).
Literature: H. & P. Sydow (1914), cited in Molina-Valero (1980); Jackson (1930).

7. *Cintractia fimbristylicola* Pavgi & Mundkur, Indian Phytopathol. **1:** 108. 1949.

On *Fimbristylis spadicea* (L.) Vahl
Colombian specimens examined: Córdoba: San Bernardo del Viento, Río Sinú, Boca de Llanos, 3 Oct 1984, *Franco Roselli 2087* (COL). **Sucre:** Tolú, 0-5 m, 18 Sep 1990, *Betancur & Berrio 1965* (COL).
This is the first record of this species of smut fungi for Colombia.

8. *Cintractia limitata* Clinton, Proc. Boston Soc. Nat. Hist. **31:** 399. 1904.

On *Cyperus ferax* (L.) Rich.
Literature: Molina-Valero (1980), as *Cintractia taubertiana* (Henn.) Clinton. The description given by Molina-Valero indicates that he studied *C. limitata.*

On *Cyperus mutisii* (Kunth) Griseb.
Literature: Molina-Valero (1980).

On *Cyperus odoratus* L.
Colombian specimen examined: Córdoba: Montería, 15 m, 24 Feb 1976, *Molina-Valero 133, mis. Buriticá* (TUB).

On *Cyperus rotundus* L.
Colombian specimens examined: Cesar: Codazzi, 29 Apr 1993, *Buriticá s.n., mis. Buriticá* (TUB). **Sucre:** Tolú, road Tolú-Coveñas, 20.5 km, Golfo de Morrosquillo, 0-5 m, 18 Sep 1990, *J. Betancur & Berrio 1986* (COL). **Tolima:** between Saldaña and Natagaima, 2-4 Jan 1973, *Acevedo & Contreras s.n.* (COL).
Literature: Molina-Valero (1980), as *Cintractia peribebuyensis* (Speg.) Saw., a synonym of *C. axicola* which was often erroneously used for specimens of *C. limitata.*

9. *Eballistra lineata* (Cooke) R. Bauer, Begerow, A. Nagler & Oberw., Mycol. Res. **105:** 423. 2001.
Entyloma lineatum (Cooke) Davis, Trans. Wisconsin Acad. Sci. **9:** 162. 1893.

On *Gynerium argentum* Nees
Literature: Molina-Valero (1980), as *Entyloma lineatum*. *E. lineata* is hitherto only known from *Zizania* spp. The Colombian material should be studied again to confirm the identification.

10. *Eballistra oryzae* (Syd. & P. Syd.) R. Bauer, Begerow, A. Nagler & Oberw., Mycol. Res. **105:** 423. 2001.
Entyloma oryzae Syd. & P. Syd., Ann. Mycol. **12:** 197. 1914.

On *Oryza sativa* L.
Literature: Bustamante et al. in Molina-Valero (1980), as *E. dactylidis* (Pass.) Cif., a collective species.

11. *Entyloma australe* Speg. Anales Soc. Ci. Argent. **10:** 5. 1880.

On *Physalis peruviana* L.
Colombian specimens examined: Antioquia: San Pedro, Represa de Entreríos, road San Pedro-Entreríos, 2850 m, 24 Sep 1998, *Gil et al. 146* (COL, TUB). **Cundinamarca:** Bogotá, 18 Apr 1939, *Quintana s.n.* (BPI 174457).
Literature: Molina-Valero (1980).

12. *Entyloma bidentis* Henn., *in* Engler, Pflanzenw. Ost-Afrikas C, p. 49. 1895.

On *Bidens pilosa* L.
Colombian specimens examined: Cundinamarca: Mesitas del Colegio, Zoológico de Santa Cruz, 1900 m, 4 Sep 1998, *Gil et al. 21* (COL, TUB). **Quindío:** Calarcá, 1750 m, 15 Sep 1998, *Gil et al. 56* (COL, TUB).
Literature: Molina-Valero (1980), as *Entyloma polysporum* (Peck) Farlow, a collective species.

13. *Entyloma browalliae* Syd., Ann. Mycol. **23:** 326. 1925.

On *Browallia americana* L.
Colombian specimen examined: Cundinamarca: Mesitas del Colegio, 1900 m, 4 Sep 1998, *Gil et al. 19* (COL, TUB).
This is the first record of this species of smut fungi for Colombia.

14. *Entyloma calendulae* (Oudem.) de Bary, Bot. Zeitung (Berlin) **32:** 102. 1874.

On *Calendula officinalis* L.
Colombian specimen examined: Quindío: Calarcá, sold on the market, 18 Sep 1998, *Gil et al. 122* (COL, TUB).
Literature: Molina-Valero (1980).

15. *Entyloma compositarum* Farl., Bot. Gaz. **8:** 275. 1883.

On *Eupatorium* sp.
Colombian specimen examined: Ciudad Universitaria, no further locality data, 12 Jul 1939, *Garcés & Quintana s.n.* (BPI 175005).
This is the first record of this species of smut fungi for Colombia.

16. *Entyloma dahliae* Syd. & P. Syd., Ann. Mycol. **10:** 36. 1912.

On *Dahlia pinnata* Cav. (= ***D. variabilis*** Desf.)
Colombian specimen examined: ANTIOQUIA: Medellín, Robledo, 8 Sep 1938, *Garcés 81* (BPI 175225).
Literature: Molina-Valero (1980).
On *Dahlia* sp. cult.
Colombian specimens examined: ANTIOQUIA: Marinilla, 22 Sep 1998, *Buriticá s.n., mis. Buriticá* (TUB); Fredonia, 1850 m, 26 Sep 1998, *Gil et al. 198* (COL, TUB). **CALDAS:** Villamaría, 12 Nov 1941, *Becerra 1072* (BPI 175217).
Literature: Dennis (1970).

17. *Entyloma galinsogae* Syd. & P. Syd., Ann. Mycol. **13:** 37. 1915.

On *Galinsoga caracasana* (DC.) Schultz-Bip.
Colombian specimens examined: ANTIOQUIA: near Medellín, Angelópolis, 29 Aug 1910, *Mayor s.n.* (holotype, BPI 175437). **VALLE DEL CAUCA:** Pradera, 21 May 1929, *Cardon & Nolla 336* (BPI 175436, 175438).
Literature: Jackson (1930).

On *Galinsoga* sp.
Colombian specimens examined: ANTIOQUIA: Medellín, Loma Pajarito, 2000 m, 24 Sep 1998, *Gil et al. 159, 171* (COL, TUB). **CUNDINAMARCA:** Sopó, 2650 m, 6 Sep 1998, *Gil et al. 37* (COL, TUB). **QUINDÍO:** Calarcá, 1750 m, 15 Sep 1998, *Gil et al. 55* (COL, TUB).

18. *Entyloma spilanthis* Spegazzini, Anales Mus. Nac. Buenos Aires **12:** 292. 1909.

On *Acmella oppositifolia* (Lam.) R. K. Jansen var. ***oppositifolia***
Colombian specimens examined: ANTIOQUIA: San Pedro, 2500 m, 24 Sep 1998, *Gil et al. 152* (COL, TUB). **CUNDINAMARCA:** Sopó, 2650 m, 6 Sep 1998, *Gil et al. 34* (COL, TUB); near Bogotá, Mesitas del Colegio, 1900 m, 4 Sep 1998, *Gil et al. 20* (COL, TUB).

On *Acmella* sp.
Colombian specimens examined: ANTIOQUIA: Fredonia, Cerro Bravo, 2000 m, 16 Sep 1998, *Gil et al. 199* (COL, TUB). **QUINDÍO:** Calarcá, 1550 m, 18 Sep 1998, *Gil et al. 121* (COL, TUB).
This is the first record of this species of smut fungi for Colombia.

19. *Farysia chardoniana* Zundel, Mycologia **35:** 171. 1943.

On *Carex polystachya* Wahlenb.
Colombian specimen examined: ANTIOQUIA: between Caicedo and Anocosoa, 2200 m, 14 Mar 1944, *Core 438* (COL).
This is the first record of this species of smut fungi for Colombia.

20. *Farysia corniculata* Vánky, Mycotaxon **43:** 423. 1992.

On *Carex jamesonii* Boott
Colombian specimens examined: CUNDINAMARCA: Calera, at National Parc Chingaza, 3100 m, 12 Sep 1998, *Gil et al. 42* (COL, TUB). **TOLIMA:** Cordillera Central, La Línea-Cerro El Campanario, 3580-3400 m, 4 Mar 1969, *Cuatrecasas & Echeverry 27696* (COL).

On *Carex lemanniana* Boott
Colombian specimen examined: TOLIMA: Santa Isabel, valley of the Río Totarito, 3650 m, 9 Feb 1980, *Jaramillo et al. 6304* (COL).

On *Carex luridiformis* MacKenzie, a new host species for *F. corniculata*
Colombian specimens examined: CUNDINAMARCA: Zipaquirá, 2600 m, 1943, *Uribe 572* (COL); Tausa, Laguna del Neusa, 3000 m, 5 Sep 1998, *Gil et al. 25* (COL, TUB). **NARIÑO:** Road to Laguna La Cocha, 10 km E Pasto, 3000 m, 10 Jan 1981, *Gentry et al. 30414* (COL).

On *Carex pichinchensis* Kunth
Colombian specimens examined: CUNDINAMARCA: Cordillera Oriental, S Usme, Páramo de Chisacá, 4020 m, 9-11 Nov 1958, *Barclay & Juajibioy 6185* (COL); Páramo de Palacio, 3200-3400 m, 5 Jan 1960, *Mora 949* (COL); Páramo de Sumapaz, Andabobos, 3800 m, 12 Feb 1972, *Cleef 1662* (COL).
This is the first record of this species of smut fungi for Colombia.

21. *Farysia thuemenii* (Fischer v. Waldh.) Nannfeldt, *in* Lindeberg, Symb. Bot. Upsal. **16:** 51. 1959.
Farysia olivacea (DC.) Syd. & P. Syd., Ann. Mycol. **17:** 41. 1919.

On *Carex haenkeana* Presl.
Colombian specimen examined: Cundinamarca: Facatativá, 28 Mar 1937, *Chardon 863* (BPI 170241).
Literature: Dennis (1970); Molina-Valero (1980), as *Farysia olivacea*.

22. *Farysia venezuelana* Zundel, Mycologia **35:** 172. 1943.

On *Carex polystachya* Wahlenb.
Colombian specimens examined: Cauca: Cordillera Central, between Puracé and Coconuco, 2300-2400 m, 12 Jul 1939, *Pérez Arbeláez & Cuatrecasas 5998* (COL); Paispamba, 2200 m, 12 Jul 1944, *Core 893* (COL). **Valle del Cauca:** 17 Oct 1944, *Cuatrecasas s.n.* (BPI 170274). **Nariño:** Túquerres, between Balalaika and Yascual, 1800-2500 m, 21 Jan 1952, *Mora 369* (COL). **Santander:** Santa Elena, 1 Jan 1931, *Archer H-200* (BPI 170269).

On *Carex porrecta* Reznicek & Camelbeke, a new host species for *F. venezuelana*
Colombian specimens examined: Antioquia: near Medellín, Angelópolis, 2000 m, 25 Sep 1998, *Gil et al. 197* (COL, TUB). **Quindío:** Pijao, road to Páramo del Chilí, 2200 m, 17 Sep 1998, *Gil et al. 85, 96* (COL, TUB).

On *Carex* sp.
Literature: Molina-Valero (1980), as *F. olivacea*. Molina-Valero probably refers to *F. venezuelana* because the size and shape of the spores he describes correspond to this species.
This is the first record of this species of smut fungi for Colombia.

23. *Jamesdicksonia brunkii* (Ell. & Galloway) J. Walker & R. G. Shivas, Mycol. Res. **102:** 1212. 1998.
Tolyposporella brunkii (Ell. & Galloway) G. P. Clinton, J. Mycol. **8:** 147. 1902.

On *Hyparrhenia rufa* (Nees) Stapf
Literature: Molina-Valero (1980), as *Tolyposporella brunkii*.

24. *Kuntzeomyces ruizianae* M. Piepenbr., Mycol. Res. **105:** 759. 2000.
On *Rhynchospora ruiziana* Boek.
Colombian specimens examined: Cundinamarca: National Parc Chingaza, 3550 m, 12 Sep 1998, *Gil et al. 47* (holotype, COL; isotypes BPI 747293, M, TUB); Páramo de Guasca, 3270 m, 4 Oct 1987, *Sánchez 411* (paratype, COL); National Parc Chingaza, 3100 m, 12 Sep 1998, *Gil et al. 45* (paratypes, COL, M, TUB). **Quindío:** Páramo del Chilí, 3600 m, 17 Sep 1998, *Gil et al. 90* (paratypes, COL, M, TUB).

25. *Kuntzeomyces ustilaginoideus* (Henn.) Henn. *in* Saccardo, Syll. fung. **14:** 430. 1899.
Cintractia occulta Mol.-Val., Caldasia **13:** 70. 1980.

On *Rhynchospora macrochaeta* Steud.
Colombian specimens examined: Cundinamarca: Zipaquirá, Páramo de Pantano Redondo, 2900 m, 3 Jul 1952, *van der Hammen 426* (COL); La Calera, Páramo de La Siberia, 3000-3500 m, 16 Sep 1953, *Langenheim et al. 3694* (COL); National Parc Chingaza, 3200 m, 12 Sep 1998, *Gil et al. 48* (COL, TUB). **Huila:** ca. 105 km from Pital on road Pital-Popayan, 2930 m, 21 Jan 1976, *Dumont et al. 3301, Buriticá 76-247, mis. Buriticá* (TUB). **Nariño:** Volcán Galeras, near Pasto, 11 Jun 1981, *Gentry et al. 30497* (COL).

On *Rhynchospora* sp.
Colombian specimens examined: Huila: between La Plata and Puracé, 3200 m, Feb 1976, *Molina-Valero et al. 16* (holotype of *Cintractia occulta*, COL).
Literature: Molina-Valero (1980), as *Cintractia occulta*.

26. *Leucocintractia scleriae* (DC.) M. Piepenbr., Begerow & Oberw., Mycologia **91:** 497. 1999.

On *Rhynchospora corymbosa* (L.) Britton
Colombian specimen examined: Valle: Feb 1944, *Cuatrecasas s.n.* (BPI 171819).
Literature: Jackson (1930), as *Cintractia leucoderma* (Berk.) Henn. Specimens of *L. scleriae* were often erroneously called *C. leucoderma*.

On *Rhynchospora* sp.
Colombian specimens examined: Antioquia: Nechí, 34 m, Jan 1996, *Delgado s.n.* (MMUNM, TUB). **Cauca:** Popayan, 6 May 1935, *Garcia 4785* (BPI 171772, COL).

27. *Microbotryum reticulatum* (Liro) R. Bauer & Oberw., *in* Bauer, Oberwinkler & Vánky, Canad. J. Bot. **75:** 1311. 1997.
Ustilago utriculosa (Nees) Unger, sensu Tul. & C. Tul., Ann. Sci. Nat. Bot. III **7:** 102. 1847.

On *Polygonum segetum* Kunth
Colombian specimens examined: CUNDINAMARCA: Mosquera, 2600 m, Nov 1977, *Galvis & Narváez 3* (COL); Chia, 2600 m, 16 Oct 1987, *Alonso & Braigthl 7273* (COL); Zipaquirá, 2600 m, 5 Sep 1998, *Gil et al. 29* (COL, TUB).
Literature: Molina-Valero (1980), as *Ustilago utriculosa*.

28. *Microbotryum tenuisporum* (Cif.) Vánky, Mycotaxon **67:** 50. 1998.

On *Polygonum hydropiperoides* Michx.
Colombian specimen examined: META: road Villavicencio-Puerto López, Río Negrito, 450 m, 13 Mar 1986, *Alonso et al. 5689* (COL).

On *Polygonum punctatum* Ell.
Colombian specimen examined: CUNDINAMARCA: Mosquera, Laguna de La Herrera, 2600 m, 8 Apr 1954, *Mora 661* (COL).
This is the first record of this species of smut fungi for Colombia.

29. *Mycosyrinx cissi* (DC.) Beck, Ann. K. K. Naturhist. Hofmus. **9:** 123. 1894.

On *Cissus quadrialata* H.B.K.
Colombian specimen examined: VAUPÉS: at Río Guaviare, 240 m, 9 Nov 1939, *Cuatrecasas 7581* (COL).

On *Cissus sicyoides* L.
Colombian specimens examined: LA GUAJIRA: Nazareth, 5 Apr 1962, *Saravia & Johnson 447-A* (COL). **ATLÁNTICO:** Barranquilla, Piojó, Jan 1929, *Elias 736* (BPI 192748).
Literature: Zundel (1953).

On *Cissus* sp.
Colombian specimens examined: ANTIOQUIA: Argelia, Río Guaitara, 20-29 Sep 1944, *Core 1401* (BPI 192790). **PUTUMAYO:** Puerto Umbría, Oct-Nov 1930, *Klug 1739* (BPI 192806).
Literature: Zundel (1953).

30. *Oberwinkleria anulata* Vánky & C. Vánky, *in* Vánky & Bauer, Mycotaxon **53:** 363. 1995.

On *Lorentzochloa erectifolia* (Swallen) J. & C. Reeder
Colombian specimen examined: SANTANDER: Cordillera Oriental, Páramo de Almorzadero, at road Chitagá-Cerrito, 3700 m, 31 Dec 1959 – 1 Jan 1960, *Barclay & Juajibioy 10342* (COL).
This is the first record of this species of smut fungi for Colombia.

31. *Sphacelotheca* cf. *koordersiana* (Bref.) Zundel, Ustilag. world, p. 96. 1953.
Sphacelotheca hydropiperis (Schumach.) de Bary, sensu auct.

On *Polygonum hydropiperoides* Michx.
Colombian specimen examined: BOYACÁ: Duitama, 2300-3100 m, 20 Nov 1994, *Alonso et al. 12025* (COL).
Literature: Molina-Valero (1980), as *S. hydropiperis*.

On *Polygonum punctatum* Ell. (= ***P. acre*** H.B.K.)
Colombian specimens examined: ANTIOQUIA: San Pedro, 2500 m, 24 Sep 1998, *Gil et al. 154* (COL, TUB). **CUNDINAMARCA:** Zipaquirá, 2650 m, 5 Sep 1998, *Gil et al. 27* (COL, TUB). **RISARALDA:** Pereira, between El Cedral and La Pastora, 2300 m, 15 Jun 1989, *Bernal et al. 1712* (COL). **RISARALDA:** La Virginia, Camino del Buiz, 25 Dec 1936, *Chardon 865* (BPI 177288).
Literature: H. & P. Sydow (1914), cited in Molina-Valero (1980); Jackson (1930), as *S. hydropiperis*.

32. *Sporisorium bicornis* (Henn.) Vánky, Mycotaxon **59:** 103. 1996.

On *Andropogon bicornis* L.
Colombian specimen examined: RISARALDA: Pereira, at road Pereira-Armenia, 1900 m, 16 Sep 1998, *Gil et al. 68* (COL, TUB).
This is the first record of this species of smut fungi for Colombia.

33. *Sporisorium concelatum* (Zundel) M. Piepenbr., comb. nov. Basionym: *Ustilago concelata* Zundel, Mycologia **37:** 372. 1945. Type. On *Ischaemum latifolium* (Spreng.) Kunth. Type. Colombia. Antioquia: Medellín, “La Normal”, Jul

1942, *Garcés s.n. in* Fungi of Colombia 389 (holotype, BPI 159676; isotype, BPI 196342).

On *Ischaemum latifolium* (Spreng.) Kunth
Colombian specimens examined: See type.

On *Panicum pilosum* Sw. (identification doubtful)
Colombian specimen examined: No further data, *García s. n.* (MEDEL 29352, TUB). The identification of the host species could not be confirmed.

34. *Sporisorium cordobensis* (Speg.) Vánky, Mycotaxon **74:** 208. 2000.
Sphacelotheca cordobensis (Speg.) H. S. Jacks., J. Dept. Agric. Porto Rico **14:** 298. 1930.

On *Trichachne insularis* (L.) Nees
Literature: Jackson (1930); Molina-Valero (1980), as *Sphacelotheca cordobensis*.

35. *Sporisorium cruentum* (Kühn) Vánky, Acta Univ. Ups. Symb. Bot. Upsal. **24** (2): 115. 1985.
Sphacelotheca cruenta (J. G. Kühn) A. A. Potter, Phytopathology **2:** 98. 1912.

On *Sorghum bicolor* (L.) Moench
Literature: Molina-Valero (1980), as *Sphacelotheca cruenta*.

36. *Sporisorium culmiperdum* (Schröter) Vánky, Mycotaxon **48:** 40. 1993.
Sphacelotheca culmiperda (J. Schröter) G. P. Clinton *in* Zundel, Mycologia **22:** 143. 1930.

On *Andropogon bicornis* L.
Colombian specimen examined: Meta: Villavicencio, 7 May 1976, *Molina-Valero 80, mis. Buriticá* (TUB).
Literature: Molina-Valero (1980), as *Sphacelotheca culmiperda*.

37. *Sporisorium holwayi* (Clinton & Zundel) Vánky, Mycotaxon **48:** 40. 1993.

On *Andropogon bicornis* L.
Colombian specimens examined: Antioquia: Nechí, Vereda Corrales, no date, *Delgado s.n.* (MMUNM 575, TUB); near Medellín, Angelópolis, 25 Sep 1998, *Gil et al. 196* (COL, TUB). **Meta:** San Martín, road to Caño del Toro, Jan 1978, *Buriticá 78-4, mis. Buriticá* (TUB).
This is the first record of this species of smut fungi for Colombia.

38. *Sporisorium panici-leucophaei* (Bref.) M. Piepenbr., Mycol. Res. **103:** 465. 1999.
Ustilago garcesi Zundel, Mycologia **37:** 372. 1945. Type. On *Paspalum saccharoides* Nees ex Trin. (identification doubtful). Colombia. Valle: Palmira, 13 Dec 1940, *Garcés s.n. in* Fungi of Colombia 1281 (type, BPI 160488).
Ustilago garcesi is a new synonym of *S. panici-leucophaei.*

On *Paspalum saccharoides* Nees (identification doubtful)
Colombian specimen examined: See type of *U. garcesi*.

On *Trichachne insularis* (L.) Nees
Colombian specimens examined: Cesar: Codazzi, 8 Feb 1976, *Molina-Valero s.n., mis. Buriticá* (TUB); Codazzi, 2 Aug 1976, *Molina-Valero 146, mis. Buriticá* (TUB). **Valle:** Palmira, 19 Oct 1938, *Garcés 122* (BPI 190258; the host species is not *Setaria vulpiseta*, as indicated on the label).

39. "Sphacelotheca" paspali-notati (Henn.) Clinton, Journal of Mycology **8**: 140. 1902. Type. On *Paspalum notatum* Flügge. Mexico. Guadalajara, 15 Sept. 1899, *Holway s.n.* (holotype, BPI 165251; isotype, BPI 165250).
This species belongs to the genus *Sporisorium* because of the presence of sori with peridia and columellae on Poaceae. Material representing this species was hitherto often called *Sphacelotheca microspora* (Schröter & Henn.) Cif. or *Sporisorium microsporum* (Schröter & Henn.) M. Piepenbr. The type belonging to these names, however, is not a species of *Sporisorium*, but a species of *Ustilago* infecting *Stenotaphrum* sp.: *Ustilago microspora* Schröter & Henn. Type. On *Stenotaphrum* sp. Brazil. Santa Catharina: Itajahy, Nov 1885, *Ule 1621* (lectotype, HBG; isolectotypes, HBG).

On *Paspalum notatum* Flügge
Literature: Jackson (1930); Dennis (1970), as *Sphacelotheca microspora.*

40. *Sporisorium reilianum* (Kühn) Langdon & Fullerton, Mycotaxon **6:** 452. 1978.
Sphacelotheca reiliana (J. G. Kühn) G. P. Clinton, J. Mycol. **8:** 141. 1902.

On *Zea mays* L.
Colombian specimen examined: Cundinamarca: Soacha, junction of Ríos Bosa and Bogotá, 20 Aug 1942, *Obregon et al. s.n.* (Herbario del Laboratorio de Fitopatología, Ministerio de la Economía Nacional; TUB).
Literature: Orjuela (1965) in Molina-Valero (1980), as *Sphacelotheca reiliana*.

41. *Sporisorium sacchari* (Rabenh.) Vánky, Acta Univ. Ups. Symb. Bot. Upsal. **24** (2): 120. 1985.
Sphacelotheca sacchari (Rabenh.) Ciferri, Flora Italica Cryptogama, Pars I. Fungi, Fasc. 17, p. 262. 1938.

On *Saccharum officinarum* L.
Literature: Molina-Valero (1980), as *Sphacelotheca sacchari*.
This species was observed only once as an accidental infection.

42. *Sporisorim veracruzianum* (Zundel & Dunlap) M. Piepenbr., Mycol. Res. **99:** 787. 1995.

On *Dichanthelium viscidellum* (Scribner) Gould
Colombian specimen examined: Antioquia: San Pedro, S Represa de Entreríos, at road San Pedro-Entreríos, 2850 m, 24 Sep 1998, *Gil et al. 147* (COL, TUB).
This is the first record of this species of smut fungi for Colombia.

43. *Testicularia minor* (Juel) L. Ling, Lloydia **14:** 109. 1951.

On *Rhynchospora corymbosa* (L.) Hitch.
Colombian specimen examined: Antioquia: Nechí, Vereda La Plata, 34 m, Jan 1995, *Delgado s.n.* (MMUNM 642, TUB).
This is the first record of this species of smut fungi for Colombia.

44. *Thecaphora polymniae* Vánky & Pardo-Cardona, *in* Vánky, Mycotaxon **59:** 101. 1996.

On *Polymnia riparia* H.B.K.
Colombian specimens examined: Antioquia: Ituango, 1500 m, 22 Sep 1994, *Pardo-Cardona s.n.* (isotypes, BPI 803032, MMUNM 606, TUB).
Literature: See above.

45. *Thecaphora pustulata* Clinton, *in* Chardón, Revista Agric. Puerto Rico **64:** 23. 1921.

On *Bidens pilosa* L.
Colombian specimens examined: Antioquia: Medellín, 4 Nov 1942, *Garcés 1738 in* Fungi of Colombia 485 (BPI 179318); Medellín, Loma Pajarito, road to San Pedro, 2100 m, 24 Sep 1998, *Gil et al. 151* (COL, TUB). **Tolima:** El Líbano, Granja de la Federación de Cafeteros, 22 Sep 1985, *Buriticá s.n., mis. Buriticá* (TUB).
Literature: Molina-Valero (1980).

46. *Thecaphora solani* (Barrus) Vánky, Mycotaxon **33:** 370. 1988.
Angiosorus solani Barrus ex Thirum. & M. J. O'Brien *in* O'Brien & Thirumalachar, Sydowia **26:** 201. 1972 (1974).

On *Lycopersicon esculentum* L.
Colombian specimen examined: Cundinamarca: Mosquera, 2600 m, Sep 1984, *Buriticá s.n., mis. Buriticá* (MMUNM 1057, TUB).

On *Solanum tuberosum* L.
Colombian specimen examined: Intercepted at Miami by *Okasako*, 1962 (BPI 179358).
Literature: Albornoz et al. (1968), cited in Molina-Valero (1980), as *Angiosorus solani*.

47. *Tilletia ayresii* Berkeley, *in* Massee, Bull. Misc. Inform. **1899:** 146. 1899.

On *Panicum maximum* Jacq.
Selected colombian specimens examined: Antioquia: Medellín, Loma Pajarito, 1900 m, 24 Sep 1998, *Gil et al. 188* (COL, TUB); Sabaneta, Variante, 1800 m, 25 Sep 1998, *Gil et al. 195* (COL, TUB). **Meta:** 8 km from San Juan de Arama to Vista Hermosa, 15 Jun 1989, *Zuloaga 4001* (COL). **Quindío:** Armenia, 1500 m, 15 Sep 1998, *Gil et al. 60* (COL, TUB); Calarcá, 1500 m, 18 Sep 1998, *Gil et al. 120* (COL, TUB). **Risaralda:** Pereira, 1600 m, 16 Sep 1998, *Gil et al. 75* (COL, TUB). **Santander:** Zapatoca, Vía San Vicente de Chucurí, at Río Magdalena, 1900 m, 12 Nov 1985, *Torres & Pinto 2765* (COL). **Valle del Cauca:** Palmira, 10

May 1984, *de la Cruz s.n.* (TUB).
This is the first record of this species of smut fungi for Colombia.

48. *Tilletia* cf. *barclayana* (Bref.) Sacc. & Syd., *in* Saccardo, Syll. fung. **14:** 422. 1899.

On *Festuca* sp.
Literature: Molina-Valero (1980).
The type of *T. barclayana* is described from *Pennisetum triflorum* Nees in India, so the material from Colombia probably represents a different, perhaps a new species, as suggested by Molina-Valero (1980).

49. *Tilletia caries* (DC.) Tul. & C. Tul., Ann. Sci. Nat. Bot. III **7:** 113. 1847.
Tilletia tritici (Bjerk.) G. Winter *in* Rabenh., Krypt.-Fl. ed. 2, p. 110. 1881.

On *Triticum aestivum* L.
Literature: Zapata (1965), cited in Molina-Valero (1980), as *T. tritici*.

50. *Tilletia colombiana* Vánky, Mycotaxon **56:** 204. 1995.

On *Brachypodium mexicanum* (Roem. & Schultes) Link
Colombian specimen examined: **Cundinamarca:** Zipaquirá, road Zipaquirá-Pacho km 32, 8 Jun 1976, *Molina-Valero 87* (isotype, TUB).
Literature: See above.

51. *Tilletia laevis* J. G. Kühn *in* Rabenh., Fungi Europ. Exs. 1697. 1873.
Tilletia foetida (Wallr.) Liro, Suomen Maanviljelys-taloudellinen Koelaitos. Vuosikirja 1915-16, p. 27. 1920.

On *Triticum aestivum* L.
Literature: Bustamante (1961), cited in Molina-Valero (1980), as *Tilletia foetida*.

52. *Tilletia rugispora* Ellis & Everhart, J. Mycol. **7:** 275. 1893.
Tilletia ulei J. Schröter & Henn. *in* Hennings, Hedwigia **35:** 218. 1896.

On *Paspalum paniculatum* L.
Literature: Jackson (1930), as *Tilletia ulei*.

On *Paspalum urvillei* Steudel
Colombian specimens examined: **Antioquia:** Bello, 15 Jun 1997, *Patiño s.n.* (TUB); Medellín, Loma Pajarito, 1800 m, 24 Sep 1998, *Gil et al. 148* (COL, TUB). **Cauca:** Valle del Cauca, Bitaco, Apr 1980, *Buriticá 80-19, mis. Buriticá* (TUB).

53. *Tolyposporella chrysopogonis* Atkinson, Bull. Cornell Univ. **3:** 16. 1897.

On *Hyparrhenia rufa* (Nees) Stapf
Literature: Molina-Valero (1980).

54. *Trichocintractia utriculicola* (Henn.) M. Piepenbr., Canad. J. Bot. **73:** 1095. 1995.
Cintractia utriculicola (Henn.) G. P. Clinton, J. Mycol. **8:** 143. 1902.

On *Rhynchospora corymbosa* (L.) Britton
Colombian specimens examined: **Antioquia:** Copacabana, 15 Jun 1946, *Arid 3964* (MEDEL, TUB); Amalfi, 1500 m, 10 Jan 1954, *Jaramillo-Mejía 680* (COL). **Chocó:** near Quibdó, at the Río Atrato, 400 m, 22 Jan 1949, *Molina & Barkley 19Ch052* (MEDEL, TUB). **Santander:** Charalá, Virolín, 1800 m, 10 Nov 1981, *Villmil et al. 13* (COL).
Literature: Dennis (1970); Molina-Valero (1980), as *Cintractia utriculicola.*

55. *Urocystis ranunculi* (Libert) Moesz, Karpat. Med. Uszögg., p. 213. 1950.

On *Ranunculus pilosus* H.B.K.
Literature: H. & P. Sydow (1914), cited in Molina-Valero (1980); Jackson (1930), as *Urocystis anemones* (Pers.) Winter, a collective species.

On *Ranunculus* sp.
Colombian specimen examined: **Caldas:** Páramos del Ruiz, La Laguna, 27 Dec 1936, *Chardon 871* (BPI 181648).

56. *Ustanciosporium neomontagnei* M. Piepenbr. & Begerow, *in* Piepenbring, Nova Hedwigia **70:** 346. 2000.

On *Rhynchospora globosa* (H.B.K.) R. & S.
Colombian specimens examined: **Meta:** Llanos Orientales, Laguna Carimagua, S Orocúe, 7 Apr 1971, *Hilton s.n.* (COL). **Vichada:** 8 km E Gaviotas, road to Santa Rita, 220 m, 25 Dec 1973, *Davidse & Llanos 5150* (COL).

This is the first record of this species of smut fungi for Colombia.

57. ***Ustanciosporium rhynchosporae*** Vánky, Mycotaxon **70:** 31. 1999.

On *Rhynchospora rugosa* (Vahl) Gale
Colombian specimen examined: ANTIOQUIA: near Medellín, Sabaneta, 1750 m, 25 Sep 1998, *Gil et al. 193* (COL, TUB).
This is the first record of this species of smut fungi for Colombia.

58. ***Ustanciosporium standleyanum*** (Zundel) M. Piepenbr., Nova Hedwigia **70:** 353. 2000.
Cintractia vesiculata Mol.-Val., Caldasia **8:** 69. 1980.

On *Rhynchospora caucana* (nom. nud.)
Colombian specimens examined: ANTIOQUIA: Rionegro, 2200 m, 7 Jul 1976, *Molina-Valero 118, mis. Buriticá* (TUB). **PUTUMAYO:** Valle de Sibundoy, Feb 1976, *Molina-Valero et al. 23* (isotype of *Cintractia vesiculata*, H.U.V. 6394).
Literature: See above.

On *Rhynchospora rugosa* (Vahl) Gale
Colombian specimens examined: ANTIOQUIA: near Medellín, near Angelópolis, 1950 m, 23 Nov 1947, *Gutiérrez & Barkley 17 C 670* (COL). **SANTANDER:** Charalá, Virolín, at the Río Guillermo, 1830 m, 11 May 1982, *Becerra & Miranda 8* (COL); Virolín, 1800 m, 6-12 May 1986, *Alonso et al. 6216* (COL).

59. ***Ustanciosporium taubertianum*** (Henn.) M. Piepenbr. & Begerow, *in* Piepenbring, Nova Hedwigia **70:** 355. 2000.
Cintractia taubertiana (Henn.) Clinton, J. Mycol. **8:** 142. 1902.

On *Rhynchospora tenuis* Kunth
Colombian specimens examined: SANTANDER: Floridablanca, road to Piedecuesta, 825 m, 9 Jul 1953, *Langenheim 3261* (COL). **VAUPÉS:** Río Kukuyarí, Yapobodá, 300 m, Apr 1953, *Schultes & Cabrera 20045* (COL).
Literature: Molina-Valero (1980), as *Cintractia taubertiana*.

60. ***Ustilago affinis*** Ellis & Everhart, *in* Cockerell, Bull. Torrey Bot. Club **20:** 297. 1893.

On *Stenotaphrum secundatum* (Walt.) Kuntze
Literature: Zundel (1953).

61. ***Ustilago avenae*** (Pers.) Rostrup, Overs. Kongel. Danske Vidensk. Selsk. Forh. Medlemmers Arbeider **1890:** 13. 1890.

On *Avena sativa* L.
Literature: Jackson (1930); Molina-Valero (1980).

62. ***Ustilago bullata*** Berkeley, *in* Hooker f., Fl. nov.-zel., vol. 2, p. 196. 1855.

On *Bromus catharticus* Vahl
Literature: Molina-Valero (1980).

63. ***Ustilago hordei*** (Pers.) Lagerh., Mitt. Bad. Bot. Vereins **1889 (59):** 70. 1889.

On *Hordeum vulgare* L.
Colombian specimen examined: CUNDINAMARCA: Bogotá, 7 Mar 1937, *Chardon 868* (BPI 161225).
Literature: Jackson (1930); Molina-Valero (1980).

64. ***Ustilago maydis*** (DC.) Corda, Icon. Fungorum **5:** 3. 1842.
Ustilago zeae (Beckm.) Unger, Einfl. Boden. Verth. Gew., p. 211. 1836.

On *Zea mays* L. (cult.)
Colombian specimen examined: ANTIOQUIA: Medellín, 2000 m, 24 Sep 1998, *Gil et al. 158* (COL, TUB).
Literature: Jackson (1930), as *U. zeae*; Molina-Valero (1980).

65. ***Ustilago nuda*** (Jensen) Rostr., Tidsskr. Landoekon. V **8:** 745. 1889.

On *Hordeum vulgare* L.
Colombian specimen examined: BOYACÁ: Tota, 2824 m, Dec 1951, *Yepes-Agredo 3196* (COL).
Literature: Jackson (1930); Molina-Valero (1980). Molina-Valero (1980) also cites *Triticum aestivum* as host for *U. nuda*, but he probably refers to *Ustilago tritici*.

66. ***Ustilago schroeteriana*** Henn., Hedwigia **35:** 215. 1896.
Tilletia paspali Zundel, Mycologia **23:** 299. 1931.

On *Paspalum* cf. *paniculatum* L.
Colombian specimen examined: RISARALDA: Pereira, road Pereira-Armenia, 1900 m, 16 Sep 1998, *Gil et al. 73* (COL, TUB).

On *Paspalum virgatum* L.
Literature: Molina-Valero (1980), as *Tilletia paspali*.

67. *Ustilago scitaminea* Syd., Ann. Mycol. **22:** 281. 1924.

On *Saccharum* sp. cult.
Colombian specimen examined: CESAR: Casacara, 27 Apr 1993, *Buriticá s.n., mis. Buriticá* (TUB).
Literature: Comstock et al. (1983), Victoria et al. (1995), and others.

68. *Ustilago striiformis* (Westend.) Niessl, Hedwigia **15:** 1. 1876.

On *Holcus lanatus* L.
Colombian specimen examined: QUINDÍO: Salento, 2100 m, 19 Sep 1998, *Gil et al. 139* (COL, TUB).
Literature: Jackson (1930); Molina-Valero (1980).

69. *Ustilago trichophora* (Link) Körnicke, Hedwigia **16:** 36. 1877.
Ustilago sphaerogena Burrill *in* Saccardo, Syll. fung. **7:** 468. 1888.

On *Echinochloa colonum* (L.) Link
Colombian specimens examined: SUCRE: Tolú, Arroyo Palo Blanco, road Tolú-Coveñas, 7.5 km, Golfo de Morrosquillo, 18 Sep 1990, *J. Betancur & Berrio 1958* (COL). **VALLE:** Valle del Cauca, Zarzal, Coloradas, 22 May 1984, *Buriticá s.n., mis. Buriticá* (TUB).
Literature: Molina-Valero (1980), as *U. sphaerogena*.

70. *Ustilago tritici* (Pers.) Rostrup, Overs. Kongel. Danske Vidensk. Selsk. Forh. Medlemmers Arbeider **1890:** 15. 1890.

On *Triticum aestivum* L.
Colombian specimen examined: CUNDINAMARCA: Bogotá, no date, *Garcés s.n.* (BPI 168492).
Literature: Jackson (1930); Molina-Valero (1980).

71. *Ustilago venezuelana* Syd. & P. Syd., Ann. Mycol. **14:** 73. 1916.

On *Paspalum scabrum* Scribn., a new host species for *U. venezuelana*
Colombian specimen examined: CUNDINAMARCA: Mesitas del Colegio, between Zoológico Santa Cruz and El Progreso, 1900 m, 4 Sep 1998, *Gil et al. 16* (COL, TUB).
This is the first record of this species of smut fungi for Colombia.

doubtful records of smut fungi for Colombia:

Sphacelotheca borealis (Clinton) Schellenberg, Ann. Mycol. **5:** 386. 1907.

On *Polygonum punctatum* Ell.
Literature: Dennis (1970).
This record probably corresponds to *S.* cf. *koordersiana*. The material has to be studied to resolve this problem.

Sporisorium neglectum (Niessl) Vánky, Symb. Bot. Upsal. **24** (2): 119. 1985.
Sphacelotheca pamparum (Speg.) G. P. Clinton, J. Mycol. **8:** 140. 1902.

On *Setaria vulpiseta* (Lam.) Roem. & Schult.
Literature: Zundel (1953), as *Sphacelotheca pamparum*.
Zundel (1953) might have based this record on the specimen BPI 190258. In this specimen, the host species is not *Setaria vulpiseta* as indicated on the label but *Digitaria insularis*. The smut is correctly identified as *Sporisorium panici-leucophaei*.

species excluded from the smut fungi:

Entyloma amaranthi Molina-Valero, Caldasia **13:** 61. 1980.

On *Amaranthus dubius* Mart.
Colombian specimen examined: Boyacá: Guateque-Santa María km 94, 10 Jun 1976, *Molina-Valero & Dumont s.n.* (isotype, TUB).
This species corresponds to *Albugo bliti* (Biv.) Kuntze (Oomycota; Vánky 1994: 454).

Key to smut fungi known from Colombia

Most character descriptions are based on observations of Colombian material. When no Colombian material was available for study, data from current investigation on Neotropical smut fungi were used. For spores the main range of the larger diameter is given.

On Amaranthaceae:
Sori as white spots of leaves. On *Amaranthus*. .... *Entyloma amaranthi* (Oomycota)
On Asteraceae:
1. Sori as pustular galls of different organs, mostly on stems; spores in balls, brownish, coarsely ornamented.............. **2** (*Thecaphora*)
1´. Sori as spots or pustules of leaves; spores simple, embedded in host tissue, hyaline, smooth... **3** (*Entyloma*)
2. Spore balls ca. 25-35 µm, made of of 1-5 spores. On *Bidens*........................ *T. pustulata*
2.´ Spore balls mostly 20-40 µm, made of 2-4 spores. On *Polymnia*................... *T. polymniae*
3(1). Sori as pustules formed by hypertrophied host tissue; spores ca. 13-16 µm. On *Galinsoga*................................. *E. galinsogae*
3´. Sori not as pustules, but sometimes convex due to large spore mass.......................... **4**
4. On *Acmella*. Spores ca. 11-14 µm.................. .... *E. spilanthis*
4´. On *Bidens*. Spores ca. 13-15 µm................. ....*E. bidentis*
4´´. On *Calendula*. Spores ca. 11-16 µm........... .... *E. calendulae*
4´´´. On *Dahlia*. Spores ca. 12-16 µm. .... *E. dahliae*
4´´´. On *Eupatorium*. Spores ca. 9-12 µm....... .... *E. compositarum*
On Cyperaceae:
1. Spores orange to light orange coloured; sori as galls in some spikelets of an infected inflorescence. On *Scleria*....... **2** (*Aurantiosporium*)
1´. Spores brownish to dark coloured; sori not as galls in some spikelets of an infected inflorescence... **3**
2. Spores ca. 13-17 µm, medium dark orange coloured.. *A. subnitens*
2´. Spores ca. 16-20 µm, light orange coloured. ....*A. colombianum*
3(1). Sori surrounding all the pedunculi of an inflorecence; spores ca. 12-16 µm, wall covered by irregular warts forming ridges. On *Rhynchospora*........ *Leucocintractia scleriae*
3´. Sori not around pedunculi or only around the bases of some pedunculi of an infected inflorescence... **4**
4. Sori in some spikelets of an infected plant; spore mass with elaters, brownish. On *Carex*. .... **5** (*Farysia*)
4´. Not on *Carex* or sori without elaters and spore mass black. **8**
5. Sori sausage-shaped, with thick brown peridia; spores ca. 5-9 µm............ *F. corniculata*
5. Sori globose, with thin grey peridia.......... **6**
6. Spores regularly globose, ca. 8-12 µm, covered by warts not in rows....... *F. venezuelana*
6´. Spores not regularly globose and/or mostly smaller... **7**
7. Spores ca. 6-8 µm, with warts in rows.......... ....*F. chardoniana*
7´. Spores of variable shape, ca. 6-10 µm........ .... *F. thuemenii*
8(4). Sori mostly around the bases of pedunculi, sometimes also in spikelets, with sterile stroma; spores very finely warty...................... .... **9** (*Cintractia* p.p.)
8´. Sori only in spikelets................................ **10**
9. Spores ca. 11-13 µm. On *Cyperus*................. .... *C. limitata*
9´. Spores ca. 14-17 µm. On *Fimbristylis*......... .... *C. axicola*
10(8). Sori with persistent, sac-shaped peridia formed by fungal cells, sori in some spikelets of an infected plant. (Peridia can be hidden by glumes.) On *Rhynchospora*.......................... **11**
10´. Sori without fungal peridia or peridia not as described. **14**
11. Spores in balls made of central sterile cells covered by a layer of teliospores; spores ca. 14-18 µm............................ *Testicularia minor*
11´. Spores single.. **12**
12. Spores mostly ca. 13-17 µm; spore wall formed by two layers, as seen by the light microscope....... *Trichocintractia utriculicola*
12´. Spores larger; spore walls formed by three

layers; the middle layer thick and hyaline... **13** (*Kuntzeomyces*)

13. Spores ca. 22-25 µm. On *R. ruiziana*.. *K. ruizianae*

13´. Spores ca. 26-32 µm. On *R. macrochaeta*.. *K. ustilaginoideus*

14(10). Sori around some ovaries of an infected plant. Not on *Rhynchospora*....................... **15**

14´. Sori in all the spikelets or in groups of spikelets of an infected plant. On *Rhynchospora*... **17**

15. Sori with sterile stroma; spores ca. 9-12 µm, with warts forming an irregular reticulum. On *Fimbristylis*..... *Cintractia fimbristylicola*

15´. Sori without sterile stroma. On *Carex*.. **16** (*Anthracoidea*)

16. Spore walls with lighter coloured areas; spores enclosing hyaline bodies, ca. 15-17 µm. .... *A. uleana*

16´. Spores without lighter coloured areas or hyaline bodies, ca. 16-19 µm....... *A. altiphila*

17(14). Sori in groups of spikelets forming witches´ brooms; spores ca. 14-17 µm, foveolate, with globose appendages.. *Ustanciosporium standleyanum*

17´. Sori on the entire plant without formation of witches´ brooms. **18**

18. Spores forming groups or balls; spores ca. 16-20 µm..... *Ustanciosporium rhynchosporae*

18´. Spores single.. **19**

19. Spores finely warty, not foveolate, ca. 14-18 µm............................. *Cintractia amazonica*

19´. Spores foveolate..................................... **20**

20. Spores ca. 11-14 µm, medium reddish brown.......... *Ustanciosporium neomontagnei*

20´. Spores ca. 13-17 µm, light to medium reddish brown.... *Ustanciosporium taubertianum*

On Poaceae:

1. Sori as stripes in leaves.............................. **2**

1´. Sori mostly in inflorescences or replacing inflorescences... **6**

2. Spores echinulate, ca. 11-12 µm; sori shredding the leaves; spore mass powdery, brown. On *Holcus*......................... *Ustilago striiformis*

2´. Spores smooth.. **3**

3. Spores regularly spherical, ca. 16-20 µm, medium to dark reddish brown. On *Hyparrhenia*............. *Jamesdicksonia brunkii*

3´. Spores not regularly spherical, smaller.... **4**

4. Spores firmly united in balls, ovoid or lacrimiform, ca. 8-13 µm, light yellowish brown. On *Hyparrhenia*... *Tolyposporella chrysopogonis*

4´. Spores not in balls but agglutinated; sori lead coloured.. **5**

5. Spores ca. 9-11 µm. On *Gynerium*.. *Eballistra lineatum*

5´. Spores ca. 8-10 µm. On *Oryza*.. *Eballistra oryzae*

6(1). Sori in different organs of the host plant, as large parenchymatous galls, white, when young, mostly in pistillate partial inflorescences; spores ca. 10-12 µm. On *Zea*.. *Ustilago maydis*

6´. Sori usually develop only in one kind of organ or complex of organs; sori not large and parenchymatous..................................... **7**

7. Sori around the more or less whip-shaped distal part of the stem, replacing the entire inflorescence by one sorus............................ **8**

7´. Sori not whip-shaped and replacing the entire inflorecence. **9**

8. Spores covered by prominent warts, ca. 6-8 µm. On *Saccharum*........ *Ustilago scitaminea*

8´. Spores more finely warty, ca. 6-7 µm. On *Ischaemum*............. *Sporisorium concelatum*

9(7). Sori replace entire inflorescences or parts of them, no glumes are developed adjacent to the sori (or glumes very rudimentary); sori with peridia and columellae......................... **10**

9´. Glumes are present close to sori; sometimes, however, the glumes are shredded; sori not always with peridia and columellae...... **14**

10. Numerous sori replace all the partial inflorescences of an infected inflorescence; spores ca. 16-20 µm. On *Andropogon*... *Sporisorium culmiperdum*

10´. Sori usually replace entire inflorescences by single sori. **11**

11. One sorus with one to two columellae corresponding to racemes; spores ca. 8-10 µm. On *Paspalum*..

.... “*Sphacelotheca*” *paspali-notati*

11´. One sorus with numerous columellae corresponding to numerous racemes or vascular tissue of the shredded host axis.................. **12**

12. Sori replace entire inflorescences or parts of them; spores ca. 11-14 µm. On *Sorghum*.... .... *Sporisorium reilianum*

12´. One inflorescence is replaced by one sorus. On *Trichachne* (*Digitaria*)............... **13**

13. Spores ca. 11-14 µm, conspicuously warty. .... *Sporisorium cordobensis*

13´. Spores ca. 7-8 µm, less prominently warty. .... *Sporisorium panici-leucophaei*

14(9). Sori destroy all the spikelets including the glumes in an infected inflorescence, sometimes also tissue of peduncles, shredding them. **15**

14´. Sori restricted to inner organs of spikelets, mostly in ovaries; glumes not shredded...... **22**

15. Spores with one flattened, lighter coloured side, ca. 6-9 µm... **16**

15´. Spores not flattened, mostly larger...... **19**

16. Spore mass agglutinated to crumbly; spores smooth. On *Hordeum*........................... .... *Ustilago hordei*

16´. Spore mass powdery; spores sparsely warty... **17**

17. On artificial media, spores germinate with basidia forming basidiospores. On *Avena*...... .... *Ustilago avenae*

17´. On artificial media, spores germinate with basidia growing with hyphae, not forming basidiospores.. **18**

18. On *Triticum*........................ *Ustilago tritici*

18´. On *Hordeum*...................... *Ustilago nuda*

19(15). On *Paspalum*.................................... **20**

19´. Not on *Paspalum*.................................... **21**

20. Spores ca. 9-12 µm, mostly without small warts on the wall surface between the larger warts, as seen by scanning electron microscopy............................. *Ustilago venezuelana*

20´. Spores ca. 14-17 µm, with numerous small warts between the larger warts, as seen by scanning electron microscopy.......................... .... *Ustilago schroeteriana*

21(19). Spores densely coarsely warty, ca. 9-11 µm. On *Bromus*................ *Ustilago bullata*

21´. Spores finely warty, ca. 6-8 µm. On *Stenotaphrum*.......................... *Ustilago affinis*

22(14). Sori with columellae and peridia. These are rather inconspicuous in sori with hypertrophic growth of host tissue....................... **23**

22´. Sori without columellae......................... **28**

23. Sori in groups of spikelets, forming witches´ brooms. On *Andropogon*............. **24**

23´. Sori not in groups of spikelets.............. **25**

24. Spores ca. 7-11 µm.... *Sporisorium bicornis*

24´. Spores ca. 11-15 µm. *Sporisorium holwayi*

25(23). Spores ca. 7-14 µm. On *Saccharum*..... .... *Sporisorium sacchari*

25´. Not on *Saccharum*................................. **26**

26. Sori usually in all the ovaries of an infected inflorescence; spores ca. 8-10 µm. On *Sorghum*...................... *Sporisorium cruentum*

26´. Sori in few to numerous spikelets of an infected inflorescence.................................. **27**

27. Spores ca. 7-9 µm. On *Echinochloa*........... .... *Ustilago trichophora*

27´. Spores ca. 10-13 µm, conspicuously warty. On *Dichanthelium*.. .... *Sporisorium veracruzianum*

28(22). Sori sac-shaped; spore mass with groups of “Y”-shaped sterile cells; spores ca. 14-20 µm. On *Panicum*............ *Tilletia ayresii*

28´. Sori not sac-shaped; spore mass without groups of “Y”-shaped sterile cells............... **29**

29. Spores ca. 10-14 µm; spore walls with dark ring. On *Lorentzochloa*..................................... .... *Oberwinkleria anulata*

29´. Spore walls without dark ring................ **30**

30. Spores smooth, ca. 16-24 µm. On *Triticum*. .... *Tilletia laevis*

30´. Spores reticulate, warty, or spiny.......... **31**

31. Spores reticulate, ca. 14-24 µm. On *Triticum*... *Tilletia caries*

31´. Spores warty or spiny............................. **32**

32. Spores covered by spines, which are slightly curved as seen at the spore profile, ca. 23-32 µm. On *Festuca* (usually on *Oryza*). .... *Tilletia* cf. *barclayana*

32´. Spores warty... **33**

33. Spores ca. 18-22 µm. On *Paspalum*............

.... *Tilletia rugispora*

33´. Spores ca. 16-20 µm. On *Brachypodium*. .... *Tilletia colombiana*

On Polygonaceae: On Polygonum.

1. Sori in some flowers of an infected plant, with columellae and peridia; spores ca. 10-13 µm, finely warty to irregularly reticulate...... ....*Sphacelotheca* cf. *koordersiana*

1´. Sori in all the flowers of an infected plant, without columellae or peridia........................ **2**

2. Spores ca. 12-13 µm, reticulate with warts in the meshes, as seen by scanning electron microscopy............... *Microbotryum reticulatum*

2´. Spores ca. 10-11 µm, reticulate without or with few fine warts in the meshes, as seen by scanning electron microscopy........................ .... *Microbotryum tenuisporum*

On Ranunculaceae:

Sori as galls mostly in leaves; spores in balls covered by sterile fungal cells. On *Ranunculus*. ....*Urocystis ranunculi*

On Solanaceae:

1´. Sori as pustular galls of tubers; spores in balls, brownish, coarsely ornamented. On *Lycopersicon*, *Solanum*.... *Thecaphora solani*

1. Sori as spots or pustules of leaves; spores simple, embedded in host tissue, hyaline, smooth.. **2** (*Entyloma*)

2. Spores ca. 13-16 µm. On *Physalis*. .... *E. australe*

2´. Spores ca. 11-14 µm. On *Browallia*........... .... *E. browalliae*

On Vitaceae:

Sori as rodlets in large witches´ brooms; spores in pairs, a single spore ca. 12-13 µm. On *Cissus*. .... *Mycosyrinx cissi*

DISCUSSION

Although the check list of smut fungi for Colombia is larger than those recently published for Costa Rica (54 species; Piepenbring 1996a-c), Panama (23; Piepenbring 2001), and Cuba (39 species, Piepenbring & Rodríguez 1998a-b) it is certainly far from complete. The present publication does not present a concluded study but is thought to encourage further research and observation of smut fungi by mycologists and plant taxonomists. There are still numerous interesting taxa to be discovered!

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